

REMARKS

The application has been carefully reviewed in light of the Office Action mailed January 16, 2002. Claims 142, 150 and 158 have been amended. Claims 142-160 are still pending in this case.

Claims 142-160 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Schellenberger et al. (U.S. Patent No. 5,714,203) in view of Ward et al. (U.S. Patent No. 5,988,186). Applicants respectfully traverse the rejection and request reconsideration.

Amended claims 142, 150 and 158 recite a substantially non-aqueous conditioning solution "for use in removing residues remaining on a semiconductor substrate after a dry etch process" comprising a fluorine source, a complementary acid, a non-aqueous solvent and a surface passivation agent, wherein the conditioning solution is "configured to minimize the removal of metal lines from exposed surfaces of [the] semiconductor substrate while [the] residues are being removed from [the] semiconductor substrate." Neither Schellenberger nor Ward, taken individually or in combination, teaches or suggests the respective inventive combinations defined by claims 142, 150 and 158.

For example, Schellenberger does not teach or suggest a substantially non-aqueous conditioning solution comprising a fluorine source, a complementary acid, a non-aqueous solvent and a surface passivation agent so as to minimize the removal of metal lines from exposed surfaces of a semiconductor substrate, much less that such minimal removal of metal lines takes place during the removal of dry etch residues, as defined by claims 142, 150 and 158. By using a substantially non-aqueous conditioning solution, the present invention reduces corrosion of exposed metal surfaces as compared with conventional aqueous conditioning solutions.

Similarly, Ward does not teach or suggest that its stripping and cleaning composition be employed after a dry etch process in order to remove residues remaining

thereafter. In addition, Ward does not mention the use of a passivation agent combined with such a non-aqueous conditioning solution. Furthermore, although Ward mentions polyhydric alcohol in concentrations of about 65%-85% by weight, it discloses a maximum of 77.5% by weight (and in most instances, significantly lower concentrations) of such alcohols in four separate examples describing the invention (Ward at column 4, lines 55-64; column 5, lines 5-12, lines 20-27, lines 39-45; column 6, lines 11-25). Moreover, Ward characterizes its stripping and cleaning composition as an "aqueous" one (Ward at claim 1).

According to MPEP § 2143, three basic criteria must be met in order to establish a prima facie case of obviousness. First, there must be some suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art (at the time of the invention) to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference, or references when combined, must teach or suggest all the claim limitations. See MPEP § 2143. At least for those reasons mentioned above, a prima facie case of obviousness has not been made in the Office Action.

Claims 143-149, 151-157, 159 and 160 depend either directly or indirectly from claims 142, 150 and 158 and are allowable for at least those reasons mentioned above and also because neither Schellenberger nor Ward, taken alone or in combination, teaches or suggests their respective inventive combinations.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejections of the claims and to pass this application to issue.

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Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

142. (Twice Amended) A conditioning solution for use in removing residues remaining on a semiconductor substrate after a dry etch process, said conditioning solution comprising:

hydrofluoric acid;

phosphoric acid;

propylene glycol; and

citric acid acting as a surface passivation agent, wherein

said conditioning solution is substantially non-aqueous and configured to minimize the removal of metal lines from exposed surfaces of said semiconductor substrate while said residues are being removed from said semiconductor substrate.

150. (Twice Amended) A conditioning solution for use in removing residues remaining on a semiconductor substrate after a dry etch process, said conditioning solution comprising:

hydrofluoric acid;

hydrochloric acid;

propylene glycol; and

citric acid acting as a surface passivation agent, wherein

said conditioning solution is substantially non-aqueous and configured to minimize the removal of metal lines from exposed surfaces of said semiconductor substrate while said residues are being removed from said semiconductor substrate.

158. (Twice Amended) A conditioning solution for use in removing residues remaining on a semiconductor substrate after a dry etch process consisting essentially of a fluorine source, a complementary acid, a non-aqueous solvent and a surface passivation agent, wherein

said conditioning solution is substantially non-aqueous and configured to minimize the removal of metal lines from exposed surfaces of said semiconductor substrate while said residues are being removed from said semiconductor substrate.